

Bulletin of the Museum of Comparative Zoölogy  
AT HARVARD COLLEGE.  
VOL. LVII. No. 1.

---

THE HENICOPIDAE OF AMERICA NORTH OF MEXICO.

BY RALPH V. CHAMBERLIN.

WITH FIVE PLATES.

CAMBRIDGE, MASS., U. S. A.:  
PRINTED FOR THE MUSEUM.  
DECEMBER, 1912.



No. 1.— *The Henicopidae of America north of Mexico.*

BY RALPH V. CHAMBERLIN.

THE genus *Henicops* was proposed by Newport in 1844 for two species, *H. maculatus*, from Van Diemen Land, and *H. emarginatus*, from New Zealand. Twenty-four years later Meinert described from Europe a species obviously related to these, placing it under a new genus as *Lamyctes fulvicornis*; but by common consent subsequent workers have, until recently, dropped *Lamyctes* as a synonym of *Henicops*. However, in 1901, Pocock restudied Newport's species and pointed out that *maculatus*, which he specified as the type of *Henicops*, differed from the European species in having the tarsi of the fourteenth and fifteenth pairs of legs, six segmented and those of the anterior pairs trisegmented, the last three pairs of legs in *fulvicornis* having the tarsi only bisegmented and the anterior legs having the tarsi wholly undivided. In accordance with these important differences Pocock again recognized *Lamyctes* as a distinct genus, at the same time describing two new genera evidently closely allied, *Haasiella* and *Paralamyctes*.<sup>1</sup> Other genera having more or less close affinities with *Henicops* and *Lamyctes* have also been described by Silvestri<sup>2</sup> and by the present writer. Silvestri and Pocock place these genera, which, it may be noted, occur in the main in the Southern Hemisphere, in a family *Henicopidae* in contrast particularly with the *Lithobiidae*, including *Lithobius* and allies which abound for the most part in the Northern Hemisphere; but Verhoeff in his recent revision of the *Lithobiomorpha* in *Die klassen und ordnungen des thierreichs* (1907, 5, p. 245f), does not recognize the family, denying the sufficiency of the basis for it. Careful study of the genera of the *Lithobiomorpha*, however, makes it very obvious that these (omitting those of the *Cermatobiidae*) fall into two compact and clearly separated groups and that, as one of these, the *Henicopidae* must be given recognition as a distinct and well-defined family.

<sup>1</sup> R. I. Pocock, Some new genera and species of lithobiomorphous chilopods. *Ann. mag. nat. hist.*, 1901, ser. 7, 7, p. 448-451.

<sup>2</sup> F. Silvestri, Descrizioni di alcuni generi e specie di *Henicopidae*. *Boll. Lab. zool. R. scuola sup. agric. Portici*, 1910, 4, p. 38-50.

The following points in which the Lithobiidae differ from the Henicopidae may be mentioned as the most important thus far noted:—

1. The labrum is tridentate instead of unidentate.
2. The inner branch of the first maxillae is armed with ramose or plumose hairs.
3. The outer branch of the first maxillae is only biarticulate.
4. When present, the eyes consist of from several to many ocelli.
5. Sternite of prehensorial segment absent, never constituting a distinct transverse sclerite or collar.
6. On none of the legs is a true tibial process or spur ever present.
7. Articular spines are present on at least part of the legs cephalad of the fourteenth pair.
8. Anal pores never present in adults.
9. Gonopods of male composed of one or, at most, of two articles and never terminating in a pointed process or rudimentary claw.

In regard to point 7 it may be mentioned that in *Watobius* and allies (subfamily *Watobiinae mihi*), which differ from the typical Lithobiidae in other points also, spines are present only on the tibiae in the place occupied by the tibial spur in the Henicopidae; while in the Henicopidae spines may very rarely occur on trochanter or on trochanter and prefemur of the fourteenth and fifteenth pairs of legs.

The following definition of the Henicopidae is based primarily upon a study of the North American representatives.

### HENICOPIDAE (*char. emend.*).

Labrum mesally deeply incised; unidentate; margins of lateral divisions bearing either plumose or else simple or nearly simple hairs.

Inner branch of first maxillae armed with simple hairs exclusively, or in part with hairs simply and shortly laciniate at tips. Outer branch triarticulate; clothed distally with plumose hairs.

Palpus of second maxillae triarticulate; claw four or five partite; distal article bearing on ventral surface toward distal end few to many plumose (ramose) hairs.

Eyes either entirely absent or consisting of a single large ocellus on each side.

Organ of Tömösvary large; situated on ventral border of head, typically caudad of position of ocellus.

Sternite of prehensorial segment well developed, extending trans-

versely as a narrow sclerite or "collar" caudad of the prosternum proper.

Tibia of all legs, or of all excepting the last one to three pairs, bearing at the distal end on the cephalic or cephalodorsal side an acute or spinous tipped process or spur. True articular spines either wholly absent (as in all N. Amer. species) or present only on last two pairs of legs.

Spiracles present on 3rd, 5th, 8th, 10th, 12th, and 14th segments, as in the Lithobiidae, or, in addition also on the 1st; or rarely present only on the 3rd and 10th segments (*Catanopsobius*).

Coxal pores present on the last two to five pairs of coxae.

Anal pores always present in adults and consisting of a single well-developed pair opening into a common median passage.

Gonopods of female long, triarticulate, and ending in a stout, strongly chitinized claw which is always entire; basal spines, so far as known, 2 + 2 or 2+3. 2nd article glabrous dorsally. Gonopods of male likewise long and triarticulate; ending in a straight, weakly chitinized process usually terminating in a bristle.

Three genera of this family are at present known to occur in America north of Mexico. They may be separated by means of the following key.

- aa. A pair of spiracles on the first leg-bearing segment.
  - Henicopinae* Chamb.
  - Tarsi of anterior legs undivided. *Lamyctes* Meinert.
- aa. No spiracles present on the first leg-bearing segment.
  - Zygethobiinae* Chamb.
  - b. Ocelli absent; only the coxae of the last four pairs of legs bearing pores. *Buethobius* Chamberlin.
  - bb. A pair of large ocelli present; coxae of last five pairs of legs bearing pores. *Zygethobius* Chamberlin.

#### LAMYCTES Meinert.

Naturh. tidsskr., 1868, 5, p. 266.

Labrum of usual form; lateral pieces not notched each side of median tooth; sides bearing sparse and simple hairs. (Plate 1, fig. 6).

Inner branch of first maxillae bearing few and entirely simple hairs. Outer branch armed with simple and plumose hairs. (Plate 1, figs. 3 and 4).

Eyes present, each consisting of a single large ocellus.

Antennae short; articles 24 to 31, but mostly 25 or 28 (in N. Amer. forms); articles beyond the second short, with marked tendency for shortest ones to recur in pairs.

Prosternum conspicuously narrowed cephalad, with anterior margin narrow. Teeth 2+2 or 3+3. (Plate 1, fig. 7).

Seven pairs of spiracles present, one pair being present on the first leg-bearing segment.

None of the dorsal plates with posterior angles produced (in N. Amer. species).

First eleven or twelve pairs of legs with tarsi entire, bearing a tibial process (Plate 1, fig. 12); last three pairs with tarsi biarticulate and tibiae without processes. Coxae of last pair of legs without caudal processes.

Coxal pores present on last four pairs of legs.

TYPE.—*L. fulvicornis* Meinert.

The four species known from the United States are small forms less than 19 mm. long. Males of none of them have been found. The species of this genus are difficult to discriminate.

#### *Key to species.*

- a. Articles of antennae normally 25; first tarsal joint of anal legs only about four times as long as its greatest width.<sup>1</sup>
  - L. fulvicornis* Meinert.
- aa. Articles of antennae 28 (–31); first tarsal joint of anal legs eight times or more as long as its greatest width.
  - b. Length 5 to 6.5 mm. *L. tivius* Chamberlin.
  - bb. Length at least 7 mm.
    - c. Greatest thickness of femur of anal legs 1.5 times the greatest thickness of tibia; antennae 3.7+ times the length of head. *L. pinampus* Chamberlin.
    - cc. Greatest thickness of femur of anal legs but  $1\frac{1}{3}$  times greatest thickness of tibia; antennae  $3.2\pm$  times the length of head. *L. pius* Chamberlin.

<sup>1</sup> In measuring the joints of the anal legs the method uniformly followed by the author has been to detach one leg and mount it with mesal surface down, measurements being then made by means of an ocular micrometer.

## LAMYCTES FULVICORNIS Meinert.

Naturh. Tidsskr., 1868, 5, p. 266.

*Lithobius gracilis* Porath, Öfvers. Kongl. vet. akad. forh., 1869, 26, p. 641.

*Lamyctes fulvicornis* Stuxberg, Öfvers. Kongl. vet. akad. forh., 1871, 28, no. 4, p. 504.

*Lamyctes fulvicornis* Meinert, Nat. tidsskr., 1872, 8, p. 343.

*Lamyctes fulvicornis* Stuxberg, Öfvers. Kongl. vet. akad. forh., 1875, 32, no. 2, p. 72.

*Lamyctes fulvicornis* Stuxberg, Proc. Cal. acad. sci., 1877, 7, p. 138.

*Henicops fulvicornis* Latzel, Die myriop. Oest.-Ung. monarchie, 1880, pt. 1, p. 133, pl. 4, figs. 31-34.

*Henicops fulvicornis* Haase, Schlesiens chilopoden, 1880, 1, p. 42.

*Henicops fulvicornis* Bollman, Entom. Americana, 1888, 4, p. 6.

*Henicops fulvicornis* Bollman, Bull. 46, U. S. N. M., 1893, p. 184.

*Henicops fulvicornis* Chamberlin (in part), Proc. U. S. N. M., 1902, 24, p. 797.

*Lamyctes fulvicornis* Chamberlin (ad part. max.), Ann. Ent. soc. America, 1909, 2, p. 191.

*Lamyctes fulvicornis* Chamberlin, Pomona college journ. ent., 1910, 2, p. 368, fig. 132 A.

*Lamyctes fulvicornis* Chamberlin, Can. entom., 1911, 43, p. 67, 98.

DIAGNOSIS.—Yellowish brown to chestnut, posterior segments and first one often darker; head mostly brownish red, often blackish along the suture; legs dusky yellow, posterior pairs brownish. Body slender, nearly eight times longer than width of tenth plate, from which the sides are nearly parallel cephalad. Head subcordate, equal in length and breadth or nearly so. Antennae short, the body being about 3.5 times longer; submoniliform; articles 25 (rarely 24 and 28 or 29). Prosternum cir. 1.75 times wider than long; teeth 3+3, the outer on each side smaller. None of dorsal plates with posterior angles produced. Coxal pores circular; usually 2, 3, 3, 3 or occasionally to 2, 4, 4, 4. Anal legs short, the body being cir. 3.5 times longer; tibia between 3 and 3.5 times as long as its thickness dorsoventrally; first tarsal joint 4 times as long as thick dorsoventrally. Gonopods of female with claw long and acute, curved; basal spines 2+2 or, rarely, 2+3, conical, with tips often bent. Length 7-11 mm., but mostly 7-9 mm.

DESCRIPTION.—Dorsum yellowish to chestnut brown, the posterior segments darker as is also frequently the first one. Head, together with the prehensors and prosternum, brownish red; the head frequently darker, blackish, along the frontal suture. Antennae yellowish red with the yellow sometimes dominating; mostly darker proximally than distally. Legs dusky yellow or brownish yellow, sometimes a little reddish distally; posterior pairs darker. Venter dusky brownish yellow with the posterior segments darker, brownish or, in some, of reddish caste.

Slender; but little attenuated cephalad from eighth segment; distinctly attenuated caudad from tenth segment as usual; 8 to 8.5 times longer than width of tenth plate. Body in general sparsely hairy, the hairs being more numerous on the legs; antennae densely clothed, the hairs more numerous distad.

Head subcordate; equal in length and breadth or very nearly so. Rugose; commonly two or three pairs of longitudinal furrows, one pair diverging cephalad with others on caudolateral portion. Punctae rather coarse and scattered.

Prosternum considerably produced cephalad, attaining the mesodistal end of prefemur; anterior edge narrow, at middle narrowly incurved. Teeth 3+3, of which the outer on each side is at the edge of anterior margin, commonly much smaller than others and spinescent (Plate 1, fig. 7). Prosternum not quite 1.75 times wider than its greatest length.

Antennae short, about 2.4 times longer than the head while the body is about 3.5 times their length. (In small specimens often relatively longer, ratio to body length being sometimes as much as 1:2.7). Submoniliform. Nearly always composed of 25 articles, very rarely of 28 or 29, or, in the other direction, of 24. First two articles long, the second being clearly the longer as usual; all others decidedly shorter; the tenth and eleventh articles uniformly shorter than the adjacent ones and in most the third and fourth articles also shortened, though frequently the fourth is shortened without the third as may also be the eleventh without the tenth.

Dorsal plates well arched; in adults mostly with a rather wide longitudinal furrow each side of the middle; the lower lateral and caudal borders set off by sulci paralleling the margins. Sometimes a very shallow median longitudinal furrow may be detected. First, third, fifth, eighth, tenth, twelfth, and fourteenth dorsal plates with caudal corners rounded and with a caudal margin mesally incurved. Seventh plate with caudal margin mesally straight, not at all incurved;



caudal corners rounded. Ninth and eleventh plates with caudal corners obliquely truncate or excised; caudal margin of thirteenth plate straight.

Ventral plates rugose and uneven; on most a deeper furrow parallel with and not far from the anterior margin and a similar one toward caudal margin, the two on anterior plates often united at ends by longitudinal furrows and thus forming a large rectangular impression.

Twelfth to fifteenth pairs of legs without tibial process. Tarsi of last three pairs of legs distinctly biarticulate; those of the immediately preceding legs often showing a suture faintly developed. All others with tarsi strictly undivided.

Anal legs short, about equalling the antennae, the body being thus near 3.5 times longer. Tibia mostly between 3 and 3.5 times as long as thickness dorsoventrally; first tarsal joint four times as long as dorsoventral thickness; the second tarsal joint 4.6 times longer than thick. Length of anal legs to that of the penult about as 4:3.

Coxal pores small, circular; mostly 2, 3, 3, 3, occasionally 2, 4, 4, 4. Each pore bearing coxa commonly with a longer bristle at distal ventral edge.

Gonopods of female sparsely pilose; claw long, acute, and entire, moderately bent and with concave side excavated; basal spines 2+2 (with rarely an extra one on one side), conical with one or both of each pair often bent ectad at tip.

Length 7-11 mm., but mostly 7-9 mm.

*Agenitalis*.—Very pale yellowish brown, with a violet tint showing through from the tissues beneath chitin; head yellowish with the region of eyes and apex of head darkened.

Ocellus very distinct.

Antennae composed of 21 to 23 articles.

Prosternal teeth 3+3, the outer one on each side minute.

Coxal pores 1, 1, 1, 1.

Gonopods extended but showing no trace either of claws or of basal spines.

Length 4.5-5 mm.; greatest width .6-.7 mm. (Latzel).

TYPE LOCALITY.—Europe.

NORTH AMERICAN LOCALITIES.—Maine (Orono!); Massachusetts (Cambridge!); New York (New York City at Mt. Lebanon); Pennsylvania!; Wisconsin (Haugen! Eau Claire! Ashland! Beloit! Menominee!); Michigan (Powers! Watersmeet! Marinette!); Illinois (Peoria!); Minnesota (Winona); Nebraska (Omaha!); Colorado (Colorado Springs!); Utah (Lake Point! Salt Lake City! East Mill

Creek! Provo!); Idaho (Pocatello!); Oregon (Portland!); Arkansas (Little Rock, see Bollman, but possibly not the real *fulvicornis*).

Also distributed throughout Europe.

No male of this species has ever been recognized. The author has examined more than a hundred individuals without detecting a male and has sectioned a considerable number of females without finding spermatozoa in the genital ducts although these are to be found readily enough in female *Lithobii*. The present evidence lends probability to the view that this species, as likely also its relatives in North America, is parthenogenetic in its usual reproduction.

This species prefers the immediate vicinity of water although the author has found it well removed from streams at times. In Wisconsin it is very common among stones and sticks at edges of streams and it was found in similar localities at Peoria, Illinois. At times it may be seen to go beneath the water if the rock upon which it is running is partly submerged.

#### LAMYCTES TIVIVS Chamberlin.

Ann. Ent. soc. America, 1911, 4, p. 33.

DIAGNOSIS.—Yellowish brown to dark brown, the last segments and the first one mostly darker. Head dusky or blackish about eyes and along suture with frontal region commonly paler. Legs yellow to brown. Body slender; between eight and nine times longer than the width of tenth plate; narrowed gradually from eighth plate cephalad. Body nearly glabrous, the hairs being short and very sparse. Head subcordate, slightly longer than wide. Antennae short; submoniliform; articles 28, varying occasionally to 31. Prosternum cir. 1.68 times wider than long; teeth 3+3, the outer one each side small and spiniform. None of dorsal plates with caudal angles produced. Coxal pores small; 2, 3, 3, 3. Anal legs short; tibia 4.5 to 5.5 times longer than thick; first tarsal joint cir. 8 times (rarely to only 7 times) longer than thick. Length 5-6.5 mm.

DESCRIPTION.—Dorsum yellowish brown to very dark brown, with the anterior and posterior segments darker as usual, dusky in the darker individuals. Often a more or less irregular dusky median band showing especially on the more anterior and more posterior segments, the borders of which are also sometimes darker. Head blackish about eyes and along suture, with the frontal region often distinctly paler.

Prosternum and prehensorial feet also of about same shade as head. Legs and antennae yellow or, in darker individuals (see var. *a infra*), the latter brownish with distal end paler and the anal legs dusky. Venter greyish to yellowish brown, the posterior segments darker as usual.

Slender; the body attenuate gradually and but little from the eighth segment cephalad and more abruptly narrowed from the tenth segment caudad; from eight to nine times longer than width of tenth plate. Nearly glabrous, being provided very sparsely with very short hairs which are more numerous on the legs. Antennae densely clothed as usual.

Head subcordate; nearly equal in length and breadth being but slightly longer (ratio 35:33 or less). Marked with two diverging sulci on posterior portion and with a number of shorter and more indistinct ones more lateral much as in *fulvicornis*. A weak furrow extending from anterior edge between antennae caudad to suture and more indistinctly to caudal margin.

Prosternum relatively a little narrower than in *fulvicornis*, being usually but about 1.68 times wider than greatest length. Extending forward to same point, or nearly so, as in *fulvicornis*. Prosternal teeth, small; 3+3, the outermost on each side much the smallest, minute or rarely obsolete or absent.

Antennae short; cir. 3.2+ times longer than the head, while the body is nearly 2.8 times longer than them. Antennae distad of the large second article submoniliform, and the articles all short. Articles from 28, the most usual number, to 31; the third and fourth, seventh and eighth, and tenth and eleventh are nearly always conspicuously shorter than the adjacent articles, while in some individuals the thirteenth and fourteenth may also show reduction. (See Plate 2, fig. 10).

Dorsal plates with the median region strongly arched and the borders low with the edges somewhat uplifted as in *fulvicornis*, presenting a longitudinal sulcus parallel to lateral margin at inner edge of depressed border with a transverse sulcus parallel to caudal border and connecting the two lateral sulci, this transverse sulcus, especially on the more anterior major scuta sharply impressed and conspicuous. Convex portion of plate in front of the transverse suture with a weaker and finer longitudinal median sulcus and one or two pairs laterad of this. The transverse sulcus, especially on the anterior segments, seems to be much more distinct than in *fulvicornis* and also relatively farther from the caudal margin. Caudal margins of minor plates

straight, or that of ninth a little bent forwards at ends but the corners of none obliquely truncate.

Ventral plates commonly roughened by transverse furrows of which one toward the anterior edge and one toward the caudal are most distinct and of these two the caudal one commonly more deeply impressed.

Tibial processes and segmentation of tarsi as in *fulvicornis*.

Anal legs short; longer than antennae in ratio 12:11, longer than penult legs in ratio 3:2; body about 2.6 times longer. Tibia 4.5-5.5 times longer than thick; first tarsal joint 7-8 times longer than thick, mostly 8 times longer; second tarsal joint 7.5 times longer than thick. (See Plate 2, fig. 9).

Coxal pores small, circular, nearly always 2, 3, 3, 3.

Claw of female gonopods long, pointed, a little curved and concave mesally as usual. Basal spines 2+2, rather stout, conical, somewhat flattened distad and often bent ectad toward tips.

Length 5-6.5 mm.

*Genitalis*—Stage I.—Body and head light brown, the latter dusky or blackish at sides. Antennae and legs very light, brownish white. Ocellus distinct but pale.

Antennae composed of 24 articles; distad of second article strictly moniliform.

Prosternal teeth small and pale; 3+3, the outer one minute, the relations being the same as in the adult.

Dorsal plates showing the transverse furrow very distinctly, the lateral ones also being evident; the median elevated portion of plate with a median and, on each side of it, another distinct longitudinal sulcus.

Coxal pores 1, 1, 1, 1.

Anal glands very distinct.

Gonopods appearing as short conical buds, already three jointed, but with no trace of claw or basal spines and entirely lacking hairs.

Length 3.4 mm.

New Orleans, var. a.

*Pullus*—Stage IV.—Coloration nearly as in the *immaturus* but a little paler.

Ocellus pale.

Antennae in one specimen composed of 19 articles of which the eleventh, twelfth, thirteenth, and sixteenth show signs of subdivision. In a second specimen apparently slightly less advanced than the preceding, 15 articles are present in the right antenna, which seems to be regenerating after a loss, and 20 on the left. Beyond second article strictly moniliform.

Three last pairs of legs appearing as long, closely appressed buds, of which the first, in one specimen, is very faintly segmented distad of the coxa, the others more indistinctly so; pale; without trace of hairs excepting one long ventral bristle on the relatively large coxa of each leg.

A single coxal pore present on each coxa of twelfth legs, this a little pigmented.

Anal glands showing very distinctly.

Anal segment with a pair of short bristles immediately beneath glands and two pairs of very long setae caudad of the glands, the two bristles of each pair being near the median line and crossing each other obliquely.

Length cir. 3 mm.

New Orleans, var. a.

LOCALITIES.—Mississippi (Byram! Holly Springs!); Louisiana (New Orleans! var. a); Alabama (Jackson!).

*Variety a.*—The specimens from New Orleans are uniformly darker than those from Mississippi and Alabama, appearing to be a little more strongly chitinized, the darker extremes of coloration noted in the description of the adults above being met with in these individuals. The tarsal and tibial joints of posterior legs are on the average also relatively more slender than in the others. Otherwise no differences could be detected, however, and complete intergradation is likely to be found.

NOTE.—The record of this species from Hot Springs, North Carolina, given in connection with the original description was an error, all specimens studied from that locality belonging to the next species. The measurement of 7.5 mm. given as the maximum length in the description mentioned pertained to a small specimen of the latter species, *L. pius*.

#### LAMYCTES PIUS Chamberlin.

*Lamyctes tivius pius* Chamberlin, Ann. ent. soc. America, 1911, 4, p. 33.

DIAGNOSIS.—Dorsum brown, the posterior segments darker and distinctly reddish. Head brownish red or chestnut, darkest back of suture. Legs yellowish, the more caudal ones darker and tinged with red. Body slender; cir. 8.8 times longer than width of tenth plate; less strongly narrowed cephalad than *tivius*. Head subcordate, slightly longer than wide. Antennae very short, being but one third

the length of the body; articles 28 (rarely 29). Prosternal teeth 3+3, the outer one reduced as usual. None of dorsal plates with posterior angles produced (for form see Plate 2, fig. 7). Coxal pores, 2, 3, 3, 3. Anal legs short, but longer than antennae, the body 2.6 times longer; tibia 5.7 or 5.8 times longer than thick dorsoventrally; first tarsal joint 8 to 9 times as long as thick; second tarsal joint 8 times longer than thick. Claw of female gonopods long, slender, and curved; spines rather stout, conical and distally flattened. Length 7.5-9.5 mm.

DESCRIPTION.—Dorsum brown, with the posterior segments darker and distinctly reddish. Head brownish red or chestnut, darker caudad of the frontal suture. Antennae light reddish brown, pale distad. Legs yellowish, the more caudal ones becoming brown and tinged, especially the proximal joints, with red. Venter brown, with the first and last segments darker; the prosternum and prehensors similar but tinged with reddish.

Slender, cir. 8.8 times longer than width of tenth plate; eighth and tenth plates of same width; body narrowed cephalad from eighth plate but little less than in *tivius*. Body sparsely clothed with short hairs which are as usual more abundant on legs; hairs of body rather more numerous than in related species, particularly than in *tivius*.

Head subcordate; very slightly longer than wide; roughened by a number of shallow longitudinal furrows.

Prosternum of nearly same form as in *fulvicornis*. Teeth 3+3, the outermost reduced as usual.

Antennae short; 3.2 times longer than head; one third the length of body; composed of 28 or rarely of 29 articles, of which those distad of the long second one are short and moniliform as in the other species; the third and fourth (or sometimes the fourth alone), seventh and eighth, tenth and eleventh, and thirteenth and fourteenth are reduced as in *tivius*.

Dorsal acute mostly with a pair of longitudinal furrows each side of middle which often rises ridge-like between them; in addition other smaller and more shallow, irregular furrows or sulci may be detected; furrows limiting the lateral and caudal depressed borders as in related species. Caudal margin of ninth and eleventh plates bowed forwards at ends, the corners of these plates in some appearing obliquely truncate but the line of truncation making but a slight angle with mesal portion of margin; caudal margin of thirteenth plate straight all the way across.

Ventral plates rugose; a deeper transverse furrow toward caudal

margin and one or two weaker ones parallel with this on anterior portion; a number of longitudinal impressed lines near sides.

Tarsi of last three pairs of legs biarticulate in the usual way, those of more anterior pairs undivided. Tibial process well developed on the first eleven pairs of legs and also weakly developed on the twelfth.

Anal legs longer than antennae in about ratio 15:13; longer than penult legs in ratio 5:3; tibia 5.7-5.8 times longer than its greatest, dorsoventral, thickness; first tarsal joint 8 to 9 times as long as thickness; second tarsal joint also about 8 times longer than thickness.

Coxal pores small and circular as in the other species; 2, 3, 3, 3.

Gonopods of the female with the claw long and rather slender; curved and excavated on mesal side; basal spines 2+2, rather stout, conical and somewhat flattened distad, the inner smaller than the outer.

Length 7.5-9.5. mm.

LOCALITIES.—North Carolina (Hot Springs! Asheville!); Georgia (Atlanta!); New Jersey (Westfield! Haddonfield!); Pennsylvania (Philadelphia!).

This species, it may be seen, in general structure and relative proportions parallels the preceding species, *L. tivius*, in a very close and interesting way; but it is at once to be distinguished by its conspicuously and constantly larger size and by its more reddish color. It also is less strongly narrowed cephalad, has some dorsal plates of somewhat different shape as above indicated, is more hairy and especially seems always to have the tibial and tarsal joints of the anal legs more slender. It seems also to occupy a distinct area, the center of which is probably the higher section of North Carolina and the adjacent parts of neighboring states; while *L. tivius* apparently occurs only in the lower and coastal region of the southeastern States.

#### LAMYCTES PINAMPUS Chamberlin.

Pomona college journ. ent., 1910, p. 2, 368, fig. 132 B.

*Lamyctes fulvicornis* Chamberlin (in part), Ann. Ent. soc. America, 1909, 2, p. 191.

*Lamyctes pinampus* Chamberlin, Ann. Ent. soc. America, 1911, 4, pl. 3, fig. 3.

DIAGNOSIS.—Dorsum dark brown, the caudal segments and often the first one darker; head brown to reddish brown, darker on sides about and in front of ocelli; legs dusky yellow to brown. Head sub-

cordate; slightly longer than wide. Body slender; near 8.25 times longer than width of tenth plate; sides but slightly converging cephalad. Antennae short; the body 2.5 times longer; articles 28, with third and fourth, seventh and eighth, tenth and eleventh, thirteenth and fourteenth, and sixteenth and seventeenth reduced. Prosternal teeth 3+3, of usual relative size and form. None of dorsal plates with posterior angles produced (for precise form see Plate 2, fig. 4). Coxal pores 2, 2, 2, 2 to 3, 3, 3, 3. Anal legs longer than in related species and much more so than in *fulvicornis*; body but about 2.35 times longer; tibia about 5.3 times longer than thick; first tarsal joint 8 times as long as thick. Claw of female gonopods nearly straight in adults, less curved than in the other species; outer spine robust, with the inner considerably smaller. Length 7-9 mm.

DESCRIPTION.—Dorsum dark brown, with the caudal plates and sometimes the first one darker; plates often darkened along middle and edges. Head darker, brown to reddish brown; darker on sides about and in front of ocelli. Antennae reddish yellow to yellowish red, the first two to four articles often distinctly less red than the others. Ventral plates dusky yellowish brown to brownish yellow, the caudal ones of reddish tinge. Legs similar in color to venter, uniform.

Slender; only very slightly narrowed cephalad from eighth plate; body nearly 8.25 or 8.3 times longer than width of eighth and tenth plates, which are of same width.

Head subcordate; very slightly longer than wide. A shallow longitudinal furrow extending caudad between antennae; on posterior portion of plate two longitudinal sulci diverging cephalad and on each side of these chiefly two others which are shorter and extend mesocephalad; two weak transverse sulci a little in front of caudal margin; lateral borders often set off by weak, fine furrows parallel with margins.

Prosternum and prosternal teeth as in the preceding species or very nearly so; that is, both scarcely differing from that of the type species, *L. fulvicornis*, which see.

Antennae short; about 3.8 times longer than head; body about 2.5 times longer than antennae. Articles nearly always 28; of these the third and fourth (or fourth alone), seventh and eighth, tenth and eleventh, thirteenth and fourteenth, and sixteenth and seventeenth are typically more shortened than the others, though in a minor number the two latter are not different in length from the adjacent ones.

Dorsal plates with caudal and lateral furrows setting off a wide low border as in the other species. Elevated median portion with a



longitudinal median sulcus and, on each side of this, two or three sulci a little diverging cephalad. Form of ninth and eleventh plates varying with age and stage of chitinization; in larger, fully chitinized individuals the caudal margin is straight with the corners not excised, or occasionally shortly so on one side; in small individuals, on the contrary, the corners are usually more obliquely and more clearly excised, much as in *fulvicornis*; while intermediate specimens have the eleventh straight like the thirteenth, the ninth still retaining the obliquely truncate or excised corners. (Plate 2, fig. 4).

Ventral plates roughened with rather fine transverse furrows or sulci of which one or two toward the caudal margin are deeper. On most plates a fine longitudinal furrow parallel with each lateral margin. Usually last three or four plates marked on each side with several distinct furrows running obliquely from the edge mesocephalad; last segment finely roughened but lacking the transverse sulci except commonly the deeper caudal one.

Anal legs longer than in the other species, the length of body being only about 2.35 times greater; longer than penult legs in ratio 53:33, or about 1.6 times longer. Tibia 5.3 times as long as thick; first tarsal joint eight times as long as thick; and the second tarsal joint  $8\frac{1}{2}$  times longer than thick. Greatest thickness of femur to greatest thickness of tibia as 1.5:1. Thickness of tibia to that of first tarsal as 1.74:1. Lengths of third, fourth, fifth, sixth, and seventh articles to each other as 37:40:46:40:30.

Coxal pores small and circular; 2, 2, 2, 2 to 3, 3, 3, 3, but most often 2, 3, 3, 2,

Claw of gonopods in fully grown females nearly straight, less curved than in the other species; flattened or excavated on mesal side; more curved in younger specimens. Basal spines 2+2; conical; the outer on each side robust, the inner being relatively smaller than in the other species and usually more acute than the outer.

Length 7-9 mm. in types; will probably be found to range considerably above this.

*Praematurus*.— Living specimens secured at Las Vegas, Nev., were light brown with a marked violet tinge, the latter fading in alcohol. Head a little darker and weakly reddish. Antennae (alcoholic specimens) yellowish brown; more greyish, less pigmented, proximally. Legs pale. A specimen from Claremont, Cal., has dorsum light brown, with the first and last plates darker, especially along the caudal borders; head dark caudad of frontal suture and blackish on sides about ocelli which have a decidedly bluish cast, and the frontal region orange

and contrasting sharply with the remaining portion; antennae orange-brown, paler proximally and on distal article; venter dusky yellowish brown, the caudal segments tending to reddish.

Head of same form as in adult.

Dorsal plates as in small adults or nearly so; the ninth and eleventh plates obliquely excised much as in the adult *fulvicornis*, but the oblique line relatively shorter.

Prosternal teeth 3+3, small, pale, with the outer on each side minute; proportions of prosternum as in the adult.

Antennae composed of 26 to 28, but mostly of 27, articles; in a minor number of specimens subdivision of one or of two of these articles is weakly indicated.

Coxal pores 2, 2, 2, 2.

Gonopods nearly as in adult; claw a little more curved; basal spines stout, conical, the outer proportionately wider at base than in adult, the inner relatively more slender than in adult but not so much shorter as usual in this stage in *Lithobii*. Bristles nearly fully developed.

Length 6-6.5 mm.

LOCALITIES:— Nevada (Las Vegas!); California (Claremont!).

#### BUETHOBIUS Chamberlin.

Ann. Ent. soc. America, 1911, 4, p. 34.

Labrum deeply incised as usual at middle; tooth conical and strongly chitinized; lateral divisions with border each side of the incision bent abruptly dorsad, strongly chitinized, and weakly notched at mesocaudal angle in such a way as to leave there a small and at times nearly obscure blunt tooth-like process apparently homologous with the lateral tooth in *Lithobius*, etc.; edge of lateral divisions bearing long plumose hairs of which those at the mesal end of the series are distally lacinate and are longest and also bearing simple hairs in an area each side of the mesal incision. (Plate 3, fig. 6).

Mandibles bearing four dentate divisions of plate of which the one at end opposite the aciculi is simple and conical the other three being set obliquely and each tridentate with the middle tooth longest and the one toward convex surface smallest (see Plate 3, fig. 3); bearing at caudal corner of distal end a row of ten to twelve large, flattened, acute aciculi which are bipectinate over the distal portion and also ectad of these and the teeth a series of finer plumose bristles.

Outer branch of first maxillae rather indistinctly triarticulate; its ultimate article clothed on mesal surface with plumose bristles and bearing at anterior end a much larger laciniate bristle (see Plate 3, figs. 2 and 4). Inner branch small, discrete from coxa, clothed with simple bristles of which one at apex is upon a much broader base and is stouter than the others (see fig. 2).

Eyes absent.

Antennae of medium length or long. First two articles long, the immediately succeeding ten or eleven greatly shortened, with those more distad longer. Articles so far as known, 36 to 45.

Prosternum with the anterior margin wide, not narrowly produced as in *Lamyctes*; teeth small, mostly 3+3.

Six pairs of spiracles present, none occurring on the first leg-bearing segment.

None of dorsal plates, so far as known, with posterior angles produced.

First twelve or thirteen pairs of legs with an acutely pointed tibial process or spur; the tarsi of these legs only indistinctly or not at all divided, the suture not affecting the dorsal side of article, but in part detectable on ventral side. (Plate 3, fig. 9).

Coxal pores present on last four pairs of legs; pores few, uniseriate and small.

Both males and females occurring commonly under the same conditions.

TYPE.—*B. oobitus* Chamberlin.

In the known species the body is more slender than in *Lamyctes* and the legs are relatively longer. The coloration is light throughout, yellow and pale orange with no darker pigment occurring.

In addition to the type species one other is at present known. The two species may be discriminated as follows:—

*Key to species.*

- a. Antennae composed of 36 articles; more than half as long as the body. *B. oobitus* Chamberlin.
- aa. Antennae composed of 43–45 articles; nearly always clearly less than half as long as the body. *B. coniugans* Chamberlin.

## BUETHOBIUS OABITUS Chamberlin.

Ann. Ent. soc. America, 1911, 4, p. 34.

DIAGNOSIS.—Dorsum, with antennae and legs, yellow; head and posterior plates of dorsum orange. Slender, being  $8\frac{3}{4}$  or more times as long as width of tenth plate; sides nearly parallel cephalad of tenth plate. Head broadly subcordate; wider than long. Antennae long, being more than half the length of the body; articles 36. Prosternum a little less than twice as wide as long; teeth small and pale, 3+3. Posterior angles of none of the dorsal plates produced. Legs long, the ultimate pair especially so, slender and without special lobes in the male; claw of anal and of penult legs single. Coxal pores small, circular. Claw of female gonopods long and slender; strongly curved; basal spines acutely conical, with the slender distal portion black. Gonopods of male long, attenuated distad; distal article bearing an acutely pointed spine. Length 10–12 mm.

DESCRIPTION.—Color in general yellow or light yellowish brown. The head, prosternum, and prehensorial feet, and, usually the more caudal segments both above and beneath, clear orange. Antennae and legs clear yellow.

Slender, the length being  $8\frac{3}{4}$  or more times as great as the width of the tenth dorsal plate. Nearly parallel sided for most of the length, being but little narrowed cephalad of the tenth plate, but more decidedly caudad as usual. Body in general sparsely hirsute; the dorsal plates with stouter bristles along the lateral margins and the minor ones with a transverse series near caudal margin; legs more densely clothed with finer hairs among coarser spinescent bristles which are few on tarsi, where they occur chiefly at the indicated juncture of first and second joints but more numerous on tibia and more proximal joints.

Head broadly subcordate; wider than long in about ratio 11:10; conspicuously narrowed in front of middle, caudad of which the sides but slightly converge; the caudolateral corners well rounded. (Plate 3, fig. 7).

Prosternum not much less than twice as wide as greatest length (32:17); not much produced cephalad, the anterior margin being very wide, widely angularly and but shallowly incised at middle. Teeth small, pale, 3+3, subequal; the innermost on each side well removed from the middle line; the middle tooth on each side farther from the outermost than from the innermost. (Plate 3, fig. 1).

Antennae long; clearly more than half the length of the body, ordinarily reaching the ninth segment. Articles 36; of which the first two are longest and the third shortest, the others increasing gradually from the third distad and commonly showing a tendency for single longer articles to alternate with pairs of somewhat shorter ones. Subdensely clothed with long bristles.

Organ of Tömösvary rather large, circular; on ventral border of head immediately in front of level of greatest width. (Plate 4, fig. 1).

Major dorsal scuta, excepting the sixth, with the caudal margin convexly rounding at corners and mesally weakly incurved; caudal margin of sixth plate slightly convex a little bent cephalad toward ends. Minor scuta have the caudal margin straight; the caudal corners of the second, fourth and sixth very shortly obliquely excised, at least on one side; the caudal margin of the ninth and eleventh, especially of the former, bent forwards at ends nearly always more strongly on one side than on the other, or else on one side only; caudal margin of thirteenth a little incurved mesally. Tergites well arched; marked with several pairs of somewhat irregular longitudinal sulci of which one a little each side of middle and mostly curving ectad at its middle and one or two each side farther toward the lateral margin are most constant and most sharply impressed; shorter impressions elsewhere largely breaking the surface into short and irregular fine rugae.

Most ventral plates with a distinct and rather wide transverse depression or furrow at level of legs, this furrow on some anterior segments replaced by two which are often considerably separated; usually several other transverse furrows or sulci which are more distinct on caudal portion of plate.

Legs all long, the ultimate pair being especially long and slender; anal and penult legs ending in a single claw or the accessory of the latter obsolete, all other legs terminating in three claws. (Plate 3, figs. 8 and 9).

Coxal pores small and circular; 3, 3, 3, 3-4, 4, 4, 4.

Gonopods of the female with the claw long, slender, and acute; strongly bent. Basal spines 2+2, acutely conical; the slender distal portion usually blackish. (Plate 3, fig. 10).

Gonopods of the male long; attenuated from base distad. Distal article ending in an acutely pointed spine. Genital duct opening through a distinctly protruding, broadly rounded process.

Length 10-12 mm. Width of tenth plate 1.3-1.4 mm.

LOCALITIES.—Mississippi (Byram! Canton!).

## BUETHOBIUS CONIUGANS Chamberlin.

Can. entom., 1911, 43, p. 383.

DIAGNOSIS.—Light orange, with head and caudal segments darker; antennae and legs yellow, except anal pair of latter which are orange. Slender;  $8\frac{3}{4}$  times longer than width of tenth plate; only slightly narrowed cephalad. Antennae normally less than half the length of the body; articles 43-45; hairs shorter than in *oabitus*. Prosternum twice as wide as long; teeth 3+3, small. Legs all long and slender. Anal legs slender and about half the length of body. First thirteen pairs of legs with tibial process. Coxal pores 2, 2, 3, 2-3, 3, 3, 3. Gonopods of male well clothed with long bristles; ultimate article terminating in a straight spine which may be a little bent at end. Gonopods of female with claw long and acutely pointed and strongly curved; spines conical, flattened distad. Length 8-10 mm.

DESCRIPTION.—Light orange with caudal segments darker. Head also darker but with the frontal region pale. Antennae and legs yellow, darker proximally; caudal pairs of legs darker, orange, especially proximally.

Body slender, being about  $8\frac{3}{4}$  times longer than width of tenth plate; only little narrowed cephalad. Entire body sparsely clothed with short among longer coarser hairs; more densely clothed as usual on legs where the longer coarse bristles are more abundant on ventral surface of tibia and proximal joints than on the dorsal surface; hairs on tarsi shorter, a pair of coarse ones on ventral surface marking the junction of the two more or less consolidated articles with often a pair distad of this. (See Plate 4, fig. 3).

Head subcordate; widest near middle, caudad of where the sides are nearly straight and a little converging, while cephalad the head is strongly narrowed; caudal margin a little excurved. Wider than long in about ratio 40:39.

Prosternum twice as wide as long. Anterior margin wide, not much extended cephalad; angularly incised at middle. Teeth 3+3, small, subequal, the outer farther from the middle one than the latter from the most mesal.

Organ of Tömösvary large, circular, and colorless; on ventral border of head at level of greatest width.

Antennae nearly always considerably less than half the length of the body, the average ratio of length of body to that of antennae being near 2.45:1, the limits observed being 2 and 3 respectively to 1, the

greater length being the rarer. Subdensely clothed with hairs that are shorter than those of *oabitus*. Articles 43-45 of which the first two are largest, a succeeding series of about ten typically greatly shortened, those at the ends of the series being shortest, while the articles distad of this series become clearly longer.

Major dorsal plates, excepting the sixth, with the caudal margin a little convex and rounded at ends and mesally incurved; the sixth with corners obliquely excised with the intervening caudal margin straight or slightly excurved. Caudal margin of minor tergites straight, the corners of ninth and eleventh in most obliquely excised though in some distinctly excised on one side only while in others the ends of the caudal margin are merely more or less evenly curved forwards. Dorsal plates with mostly four distinct longitudinal sulci, one a little removed from each lateral margin and one a little each side of the median line, shorter broken impressed lines wrinkling the surface between them; a weaker transverse impression in front of caudal margin.

Ventral plates finely wrinkled transversely, mostly so on the caudal half to two thirds of length, and a longitudinal furrow or impression a little mesad from each lateral margin. Last two or three sternites smoother; often with fine impressed lines running from caudolateral edge cephalomesad but these short and not affecting the middle portion of plate.

Legs all long. First twelve pairs with tarsi undivided but with the tegument between the two parts not strongly chitinized and thus more or less flexible, there being, however, no true joints. Tarsi of last three pairs of legs truly biarticulate. First thirteen pairs of legs with spinous tipped process or spur. First thirteen pairs of legs with three well-developed claws; the fourteenth pair also with accessory claws but these reduced.

Anal legs long and slender and otherwise alike in both sexes; nearly half as long as body (7:15); longer than penult in about ratio 14:11.

Coxal pores circular and rather small; 2, 2, 3, 2-3, 3, 3, 3; the more proximal in each series smaller than the more distal.

Caudal process of 15th coxae long, acute, and spinous tipped.

Gonopods of male with the three articles all well clothed with long bristles. Terminal spine often a little bent at apex. Penial process cylindrical or more or less narrowed or constricted proximally. (Plate 4, fig. 3).

Gonopods of female with articles bearing long bristles ventrally, but glabrous on dorsal surface. Claw long and acutely pointed and

strongly curved. Spines 2+2, conical, flattened distad, the outer one on each side a little stouter.

Length of male 9-10 mm. Length of female 8-9 mm., the average size being less than that of male.

*Pseudomaturus*.— Body brownish yellow, with the head and caudal segments light orange; antennae and legs yellow.

Proportions in general nearly as in adult; but in specimen measured head a little longer than wide (47:46).

Antennae of about same proportionate length as in adults; composed of 39 articles in which the series of ten shortened articles following the second is already present.

Prosternal teeth 3+3 with relations as in *maturus*.

The long bristles of dorsum arranged chiefly along lateral edges and in a transverse row across caudal portion of each minor tergite and of sixth with a few in a transverse row across anterior portion; on ventral plates chiefly confined to a transverse row across anterior border; the hairs elsewhere short.

Coxal pores 2, 3, 3, 3; pigmented.

Tibial process of first thirteen pairs of legs distinct; no indication of subdivision in tarsi of first twelve pairs; claws as in *maturus*.

Anal glands strongly developed.

Sternite of genital segment with 8-10 bristles on each side. First and second joints of female gonopods each with about four, the third with 2-3 bristles. Claw of gonopods shorter and paler than in adults and more obtuse, well excavated on mesal side. Basal spines smaller than in adult but nearly similarly related, but the inner ones relatively a little smaller.

Length 7.5 mm.

*Praematurus*.— Coloration nearly as given for *pseudomaturus*.

Head a little longer than wide.

Dorsum with relatively very long setae along the lateral margins of plates, the one at each posterior corner directed caudad. Each minor tergite with the usual transverse row of bristles along caudal border. Fewer long bristles in a transverse row across anterior border of each ventral plate.

Antennae relatively shorter than in adult and *pseudomaturus*. Articles 31 with the series of more shortened ones succeeding the second consisting of but 5, each of which probably would normally divide to give to the series the adult number.

Prosternal teeth 3+3; small and pale; related as in *maturus*.

Coxal pores 1, 2, 2, 2.



Anal glands well developed.

Sternite of genital segment bearing on each side three bristles. First article of female gonopods with three bristles, second with two or three and the ultimate with two of which one is long and one short. Claw pale and thin, weak. Basal spines all present, but short and pale with the inner one of each pair more slender and much shorter than the outer, extending scarcely distad of the middle of the latter.

Length 6.75 mm.

LOCALITIES:— California (Berkeley! Mill Valley!).

### ZYGETHOBIUS Chamberlin.

Ent. news, 1903, 14, p. 335.

Labrum mesally deeply incised and unidentate as in other genera of the family; tooth acutely conical and strongly chitinized; lateral divisions not at all notched at median excavation. Lateral portions with a fringe of plumose hairs along margin much as in *Buethobius*, some of which also occur on caudal portion of dorsal surface which also bears more cephalad an area of simple hairs (see Plate 5, fig. 2).

In the mandibles at distal end and beginning at cephaloventral end of dentate plate are, first, three pairs of stout, obliquely placed teeth followed next to caudal angle by a fourth pair consisting of one large tooth and a much smaller one. Pectinate aciculi and plumose hairs nearly as in *Buethobius* but the aciculi fewer, being mostly about 6 in number (see Plate 5, fig. 5).

Both branches of the first maxillae separated from the coxae. Inner branch armed with simple hairs and hairs that are laciniate at distal end, the latter showing two, three, and more branches, but no truly ramose or plumose hairs are present. Outer branch clearly triarticulate; the ultimate article bearing plumose hairs on mesal surface; no branched aciculi at anterior end. (Plate 5, figs. 3 and 4).

Eyes present, each consisting of a single large ocellus which is larger than that in *Lamyctes* and is situated farther forward.

Antennae long; in known species consisting of from 38 to 43 articles.

Prosternum with anterior margin wide and not much extended forward; teeth 3+3. (Plate 4, fig. 6).

Only six pairs of spiracles present, none being found on first leg-bearing segment.

Posterior angles of ninth, eleventh, and thirteenth, or of these with seventh, or of these with both sixth and seventh, strongly produced.

First fourteen pairs of legs or else all fifteen pairs with acute tibial process. (Plate 4, fig. 8). Prefemur of legs with small pointed process at distal end on dorsal side. Tarsi of all legs biarticulate. The first tarsal joint increasing in size from first to last pairs of legs, in the caudal pairs being very long and slender. All legs ending in three claws.

Coxal pores present on the last five pairs of legs.

Both males and females occurring commonly under the same conditions.

Gonopods of female of type usual in family, the claw being large and entire and serrate along dorsal edge (see Plate 4, fig. 4).

Gonopods of male with ultimate article ending in a large, straight, weakly chitinized process or claw the edges of which are finely serrate (see Plate 5, fig. 8).

TYPE.—*Z. dolichopus* Chamberlin.

The members of this genus are of medium size. The body in all is conspicuously narrowed cephalad from the eighth segment and the legs are relatively long, particularly the posterior pairs. Of the four species at present known, three occur in the mountains of the western part of the continent, the fourth occurring in the mountains of Virginia and Tennessee.

#### *Key to subgenera and species.*

a. First fourteen pairs of legs with tibial spurs, none being present on the anal pair; posterior angles of ninth, eleventh, and thirteenth or of these and the seventh as well, produced.

*Zygethobius* Chamb.

b. Body prevailingly brown, reddish pigment being absent or nearly so; more loosely joined and relatively longer articles of antennae beginning with the fifteenth.

c. Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced; articles of antennae 39 or 40; body eight times longer than width of tenth dorsal plate.

*Z. dolichopus* Chamberlin.

cc. Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates produced; articles of antennae 41; body but about seven times as long as width of tenth plate.

*Z. columbiensis*, sp. nov.

bb. Body brown to chestnut, reddish pigment commonly promi-

ment; more loosely joined and relatively longer articles of antennae beginning with the seventeenth.

Body eight times as long as width of tenth plate.

*Z. sokarienus* Chamberlin.

- aa. All legs with well-developed tibial processes; posterior angles of sixth, seventh, ninth, eleventh, and thirteenth dorsal plates produced.

*Zantethobius* Chamb.

Articles of antennae 43; body seven times longer than width of tenth dorsal plate.

*Z. pontis* Chamberlin.

#### ZYGETHOBIUS DOLICHOPUS Chamberlin.

*Henicops dolichopus* Chamberlin, Proc. U. S. N. M., 1901, 24, p. 797.

*Henicops fulvicornis* Chamberlin, (in part), Proc. U. S. N. M., 1901, 24, p. 25.

*Zygethobius dolichopus* Chamberlin, Ent. news, 1903, 14, p. 335.

*Zygethobius dolichopus* Chamberlin, Pomona college journ. ent., 1910, 2, p. 368.

DIAGNOSIS.—Dorsum yellowish brown to dark brown, with first and last plates commonly darker and more reddish; head darker, often chestnut to nearly black with median and posterior portions paler; legs yellow to brown, more reddish distad, the posterior pairs darkest; the whole often suffused with violaceous. Head subrotund, longer than wide. Body strongly narrowed cephalad from tenth dorsal plate and more abruptly caudad; eight times longer than width of tenth plate. Antennae long; articles 39 or 40; articles distad of the fourteenth more loosely joined and showing an alternation of shorter ones in pairs with single longer ones, but the last six all long. Prosternal teeth, 3+3, small, the two innermost on each side closer together. Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced. Coxal pores 3, 3, 3, 3-3, 4, 5, 5, 4, circular. Legs all long, especially the caudal pairs; tibial process present on legs of first fourteen pairs. Claw of female gonopods large, not strongly curved; basal spines 2+2 or 2+3; conical in outline, dorsally excised distad, with plane of inner nearly at right angles to outer. Length 11.4-12.6.

DESCRIPTION.—Color of dorsum yellowish brown to dark brown, first and last plates darker, sometimes reddish brown. Head frequently very dark, its anterior and lateral portions reddish, at times verging to black with the middle and posterior portions paler. Antennae yellow to brown, reddish brown or chestnut at base. Ventral plates smoky yellow. Legs mostly yellow, brown or somewhat red-

dish brown toward extremities; posterior pairs darkest. The color of all parts as above given subject to modification by a more or less strong violet tint from the deeper tissues, this being particularly strong in the head and in the anterior and posterior dorsal plates and particularly in younger or recently moulted individuals.

Body moderate; about eight times longer than width of tenth dorsal plate; strongly narrowed cephalad from tenth dorsal plate and abruptly narrowed caudad of this plate as usual. The cephalic plate sparsely hirsute with long and short bristles, the first dorsal plates being clothed subsimilarly to cephalic plate, the last few plates more sparsely clothed, the median portion of the most posterior being subglabrous; legs clothed more abundantly with shorter, finer hairs among longer and stouter, spinescent bristles which are more abundant on the ventral and lateral surfaces of joints proximad of tarsus; antennae densely subpilose.

Head mostly longer than wide, typically in about ratio 12:11; subrotund, widest near middle of length. Lateral margins strongly convexly rounded at middle, caudad of which they are nearly straight or weakly incurved and converge to the truncate caudal margin with the corners well rounded; conspicuously narrowed in front of middle; anterior margin between antennae from nearly straight to a little incurved. Strongly convexly elevated. A distinctly marked furrow extending from ocellus to ocellus and curving caudad from its ends to middle; on caudal portion of plate two broad and distinct furrows which diverge cephalad to the transverse furrow; a broad shallow median longitudinal impression in front of the suture. Lateral and anterior borders of head commonly depressed.

Ocellus very large; strongly convex; bluish; margin not sharply defined.

Antennae long; attenuated from base, becoming much more slender distad. Articles 39 or 40, when 40 the ultimate articles commonly proportionately shorter; second article much longest as usual; usually the four succeeding the second subsimilar to each other, of moderate size, while the next eight are shorter and likewise similar to each other; articles succeeding the fourteenth longer and more slender and more loosely articulated, with among them in most specimens a regular alternation of two shorter articles with one clearly longer one excepting that the last six are all long.

Prosternum twice as wide as long; the anterior margin arching forward in a semicircle, angularly incised at middle as usual. Prosternal teeth 3+3, small and pale; on each side the two innermost

proximate and often elevated together, the outermost being separated by a wider and deeper interval and the prosternal margin beneath it less produced.

The posterior angles of the ninth, eleventh, and thirteenth dorsal plates strongly produced. Dorsal plates strongly arched; each of the major scuta with five more or less evident longitudinal sulci, two lateral parallel with each side, one median and two intermediate diverging caudad; the two lateral sulci continuous with a transverse depression or furrow (sometimes double) running parallel with and a little cephalad of the posterior margin, corresponding lines often being traceable on the head.

Ventral plates with a number of transverse impressed lines on caudal half, one at middle and one between this and caudal margin ordinarily deeper than the others.

Legs all long, the more caudal ones being conspicuously so and ordinarily elevating the caudal portion of body considerably. Tarsi relatively long, the first joint being much longer than the second. Tibial process present on each leg of the first fourteen pairs.

Anal legs very long and slender, not at all crassate or otherwise specially modified in either male or female.

Last five pairs of coxae deeply furrowed or fluted along caudoventral surface, the furrow being limited by well-chitinized ridges or plates. In these furrows occur the uniseriate, circular pores which in number and arrangement vary from 3, 3, 3, 3, 3 to 3, 4, 5, 5, 4.

Claw of female gonopods large, acute, and weakly incurved. Basal spines 2+2 or 2+3; the flattened, broader surface, conical in outline with the inner one set nearly at right angles to the outer and in ventral view therefore appearing much thinner; both spines usually bent ectad at distal end.

Anal glands conspicuous; the common median passage relatively large.

Length 11.4–12.6 mm.; width 1.5–1.7 mm.; length of antennae 5.6–6 mm.; of anal legs 6–6.5 mm.

*Praematurus*.— Ground color light brown to yellow, but in life this color mostly masked by the violet from beneath. Head appearing purple, often very dark. Antennae light brown or yellow. Ventral plates in life appearing mainly violaceous or lavender.

Antennae composed of from 31 to 36 articles.

Prosternal teeth 3+3 as in the adult.

Coxal pores moderately large; groove shallow; 2, 2, 2, 2, 2–3, 3, 3, 3, 3,

Gonopods short. Claw short and pale; basal spines 2+2 but small, the inner one commonly a short point.

Length of body 8-8.4 mm.; width 1.2 mm.; length of antennae 4.6 mm.; of anal legs 4-4.3 mm.

*Agenitalis* — Stage I.— Color yellowish brown, head darker. Legs and antennae smoky white.

In the one specimen of this stage obtained the forty articles of the antennae are already present, the individual doubtless being exceptional in this regard.

Prosternal teeth minute or obscure.

Ocelli distinct; considerably larger than in the following stage.

Gonopods appearing merely as incipient buds.

Coxal pores 2, 2, 2, 2, 2.

Length of body 5.5 mm.; width .65 mm.; length of antennae 2.5 mm.

*Pullus* — Stage IV.— Last three pairs of legs appearing as pale appressed buds.

General color yellowish. Antennae and legs white.

Ocelli small; colorless.

Coxal pores 1, 1; very small.

Length of body 3-4.6 mm.; length of antennae 2.1-2.5 mm.

LOCALITIES.— Utah (in the Wahsatch Mts., chiefly at elevations from 6,000 up to 10,000 feet above sea-level. Farmington Canyon! City Creek Canyon! Mill Creek Canyon! Neffs Canyon! Little Cottonwood Canyon! Big Cottonwood Canyon! American Fork Canyon! Spanish Fork Canyon! Also in Uintah Mts.); California (Truckee! in the Sierra Nevada).

In the Wahsatch Mts. the species is found at the upper elevations under wood and stones along streams, about springs, and near melting snow, and is not uncommon under the fallen logs of coniferous and quaking aspen woods away from running water. It prefers especially cool and humid situations.

#### ZYGETHOBIUS SOKARIENUS Chamberlin.

Can. entom., 1911, 43, p. 382.

DIAGNOSIS.— Dorsum reddish brown to chestnut, with head and ultimate segments darker; head uniform in color; legs brown, paler distally, the posterior pairs darker. Head subrotund, longer than wide; widest in front of middle; sides but moderately convexly bulging. Body about eight times as long as width of tenth plate; strongly

narrowed cephalad. Antennae long; articles 38 or 39; articles distad of the sixteenth relatively more slender and more loosely articulated, with shorter ones in pairs alternating with longer single ones but last six all of longer type. Prosternum with anterior margin widely rounding as usual; teeth 3+3. Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced. Coxal pores 2, 3, 3, 3, 3-3, 4, 4, 4, 4; circular and small. Legs long; tibial spur occurring on each leg of the first fourteen pairs. Claw of female gonopods long and acute, moderately curved; basal spines 2+2, distally thin, conical in broader outline, with the inner set at an angle with the outer. Gonopods of male long; ending in an acutely pointed and bristle-tipped process or claw of which the ventral edge is serrate. Length 11-13 mm.

DESCRIPTION.—Dorsum reddish brown or chestnut, with the ultimate segments darker. Head darker than dorsum, uniform. Antennae dark reddish brown proximally, becoming pale distad. Venter from light to dark brown, often of reddish tinge, the posterior segments usually darker. Prosternum usually of same color as venter but sometimes darker, in which case the prehensors are paler, especially distally. Legs usually brown, sometimes dark excepting proximally and distally; the posterior pairs, as usual, commonly darker than the others.

Body moderate; about eight times longer than width of tenth plate; conspicuously narrowed from tenth plate cephalad and abruptly caudad. Sparsely clothed with shorter, finer hairs and with longer coarse spinescent bristles, the latter being more especially arranged in series at lateral and caudal edges of dorsal plates and also across anterior portion of major ones. The bristles more abundant on legs. Antennae densely clothed with straight hairs of which there are short and moderately long ones, the latter becoming reduced from proximal to distal articles.

Head normally longer than wide (12:11, nearly); subrotund, but sides not so strongly convexly bulging as in *dolichopus*; widest in front of middle, from where the sides caudad are substraight or a little incurved to the rounded caudal corners; caudal margin straight; head narrowed cephalad as in *dolichopus*. Head convexly elevated. Conspicuously constricted or furrowed in a semicircle curving caudad from the ocelli; two furrows on caudal portion of plate diverging forward from a common point and on each side of these are several subparallel sulci; a shallow median longitudinal furrow extending caudad between antennae to the transverse furrow. (Plate 4, fig. 5).

Ocelli very large; bluish.

Antennae long, being one half or nearly one half as long as the body. Articles 38 or 39, of which the second is much longer; the fourteen articles succeeding the second are short and closely telescoped, the first four in this series being commonly somewhat larger than the others; articles distad of the sixteenth clearly longer and more freely joined, with shorter ones in pairs normally alternating with single longer ones in the usual way, excepting the six ultimate which are all of the longer type.

Dorsal scuta well arched, with lateral and caudal borders depressed and the lateral margins bent somewhat dorsad; each with a distinct median longitudinal furrow extending entirely across plate; on each side several shorter sulci of which the two most mesal converge together caudad, forming thus a v-shaped mark. Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced. Caudal margins of plates apparently less incurved than in *dolichopus*.

Caudal margin of more anterior sternites truncate, but in the posterior ones more or less convexly rounded. Plates marked with fine transverse furrows of which one caudad of and one cephalad of the middle are usually distinctly deeper.

Prosternum twice as wide as long. Anterior margin semicircular. Teeth 3+3; subequal; the interval between these teeth in some about equal but in others the outer one on each side is more widely removed from the median than the latter is from the innermost. (Plate 4, fig. 6).

Legs of usual type, all being long and having tarsi markedly slender with the first joint especially long. The small, pointed process at distal end on dorsal side of the prefemora better developed and more spine-like on the more caudal pairs of legs. Tibial process present in first fourteen pairs of legs only. (Plate 4, fig. 8).

Anal legs in both sexes long and slender and without special modifications. The lengths of third, fourth, fifth, sixth, and seventh articles are to each other about as 38:41:50:61:28 and their widths as 13:11.5:8:4:3. In the penult legs the lengths of these joints are related as 31:35:41:45:16.

Porigerous surface of last five pairs of coxae but moderately depressed and the furrow typically not extending entirely to distal end of the joint, the lateral walls or chitinous ridges uniting distad of it to form a median keel. Pores circular, decreasing in size proximad; 2, 3, 3, 3, 3-3, 4, 4, 4, 4.

Claw of female gonopods long and acute, but moderately curved,



the ventral edge finely serrate. Basal spines 2+2, flattened distad; conical in broader outline; the inner on each side set more or less at an angle to the outer and its outline in ventral view, presenting its lesser thickness, as a consequence appearing much more slender than the outer. (Plate 4, fig. 4, and Plate 5, fig. 6).

Gonopods of the male long and with same divisions as in the female; ending in a long, straight and acutely pointed process or claw which is bristle tipped and has its ventral edge serrate, this claw but weakly chitinized. Articles densely clothed with long bristles. Penial process subcylindric, running to a point at apex on dorsal side. (Plate 5, fig. 8).

Length 11–13 mm. Males and females apparently not differing in size.

LOCALITY.—California (Mill Valley!).

Of the ten type specimens, four are males.

#### ZYGETHOBIUS COLUMBIENSIS, sp. nov.

DIAGNOSIS.—Dorsum brown; head dusky; antennae and legs flavid. Head suborbicular; of nearly equal length and width. Body robust, being only about seven times as long as the width of the eighth dorsal plate; strongly narrowed cephalad as in related species. Antennae long; articles 41, the more loosely joined ones beginning with the fifteenth, among them being the usual alternation of shorter and longer ones and the last six all being of longer type. Prosternal teeth very small, 3+3. Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates produced. Legs long and slender; tibial spurs present as usual. Claw of female gonopods long and moderately strongly curved; basal spines very acutely pointed, of moderate width at base. Length 14.5 mm.

DESCRIPTION.—Original color difficult to determine from type specimen. At present the specimen is brown, paler along the median dorsal line. Head dusky. Antennae and legs flavid.

Body robust, being about seven times longer than the width of the eighth dorsal plate, the tenth plate being nearly of same width as the eighth; strongly narrowed cephalad from eighth plate to the first which is slightly narrower than the head; third plate manifestly wider than the first. Widths of head and first, third, eighth, tenth, and twelfth dorsal plates to each other about as 40:39:45:56:55:52. First plate 1.85 times wider than long; widest a little cephalad of its

middle, the sides being moderately convex and rounding in well mesad at anterior ends.

Head about equal in length and breadth; suborbicular with the sides strongly convexly bulging caudad of the ocelli. A rather deep transverse sulcus a little in front of caudal edge and two pairs of longitudinal sulci diverging cephalad from this transverse furrow.

Ocelli large; bluish.

Antennae long; extending to or beyond the middle of the body; strongly attenuated distad. Articles 41; of these the first fourteen are relatively more compact as in *dolichopus*, etc., but the transition to the relatively slender and more loosely joined articles more gradual than usual; beyond the fourteenth article shorter articles recur in pairs in the ordinary way, the last six, however, all being of the longer type.

Prosternum twice as wide as long. Teeth very small or almost obscure; 3+3. Margin on each side meeting its mate at very obtuse angle, a mesal incision being scarcely developed.

Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates strongly produced; angles of the last three long and acute, while those of seventh have caudal side long and convex, the mesal portion of the plate being deeply incurved. Dorsal scuta strongly arched, with the caudal and lateral borders depressed as usual; each plate with a pair of distinct longitudinal sulci with outside of each one of these a second shorter and more or less divergent sulcus.

Anterior ventral plates broadly depressed from edges to middle. Most plates with indications of three longitudinal sulci of which one toward each side is more distinct than the median. A transverse furrow a little in front of caudal margin especially distinct; one or two more anterior ones present which are less so.

Legs all long with their tarsi conspicuously slender as usual, considerably more so than the tibia which, in turn, is abruptly more slender than the femur. Prefemoral and tibial processes as usual.

Porigerous area of coxa deeply depressed, with the edges well chitinized. Pores circular; about 3, 3, 4, 4, 4, to 4, 4, 4, 4, 4 in number and arrangement.

Claw of female gonopods entire, long and strongly curved, acutely pointed. Spines as usual, acutely attenuated from base distad; of but moderate stoutness.

Length 14.5 mm.; antennae 8 mm. long; width of eighth dorsal plate 2.1 mm.

LOCALITY.—British Columbia (Powder Creek, Kaslo!).

The single type is a female.

## ZYGETHOBIUS PONTIS Chamberlin.

Ann. Ent. soc. America, 1911, 4, p. 34.

DIAGNOSIS.—Dorsum chestnut with a narrow longitudinal stripe blackish; first segment darker; head deep or blackish brown; legs brown, paler proximally, excepting last pairs which are darker, being blackish proximally and pale distad. Head subrotund, widest caudad of middle. Body robust; but seven times longer than width of tenth plate; strongly narrowed cephalad and more abruptly caudad as usual. Antennae very long; articles 43; those articles distad of the fourteenth more loosely joined with the usual occurrence of shorter articles in pairs excepting among the last four which are all long. Teeth of prosternum 3+3. Posterior angles of sixth, seventh, ninth, eleventh, and thirteenth dorsal plates produced, those of the seventh least so. Coxal pores circular, small; 3, 3, 4, 4, 4. Legs long and especially slender distad; tibial process present and well developed on all fifteen pairs of legs.

DESCRIPTION.—Dorsum chestnut in color with a narrow longitudinal median stripe blackish; first segment darker than the others. Head deep or often blackish brown. Prehensors, prosternum, and antennae reddish, the last mentioned becoming pale, yellowish distad. Venter yellowish to light brown, with the more caudal plates reddish. Legs brown, paler proximally than distally; last pairs of legs darker, blackish proximally, pale distad.

Robust, being but seven times longer than the width of the tenth dorsal plate. Strongly narrowed cephalad and caudad of the tenth dorsal plate, the first segment being conspicuously narrow. Clothed sparsely with coarse longer hairs and shorter finer ones, the longer ones occurring chiefly along edges of dorsal plates and on the head as spinescent bristles conspicuous among the shorter ones; antennae subdensely clothed with straight hairs and finer shorter ones that are bent or curled at their tips; legs as usual more densely clothed than body.

Head subrotund; widest a little caudad of the middle, the sides caudad of this being nearly straight and converging to the rounded caudad corners; the longer anterior portion of head conspicuously narrowed; anterior margin between antennae straight or mesally a little indented. Head elevated; marked with a transverse furrow or constriction along or a little caudad of the suture, each end of the furrow being in front of the corresponding ocellus; a v-shaped impression consisting of two furrows diverging from a common point cephalad

on posterior portion of head with on each side of this two short sulci parallel to the corresponding arm of the v and on each side parallel with the margin a long furrow extending from a little in front of the caudal margin forward and dorsad of upper edge of ocellus where it joins the transverse furrow or constriction.

Ocelli large but smaller than in *sokarienus*, etc.

Antennae very long, being more than half the length of the body. Articles 43, of which the second is as usual relatively very long, the next twelve being short and compactly telescoped, those distad of these being more slender and more loosely joined; the first ten articles immediately distad of these precede a much longer one which in turn is succeeded by shorter ones than which the four preceding the ultimate are much longer; ultimate article very long. (Plate 5, fig. 9).

Prosternum twice as wide as greatest length or nearly so. Anterior margin semicircularly curved forwards. Teeth 3+3, of which the outermost on each side is more removed than the innermost from the median one.

Dorsal plates with median portion well elevated; a deep wide furrow immediately mesad of each lateral and somewhat upturned margin, a second narrower sulcus occurring a little mesad of this while between this and the median longitudinal furrow are several shorter sulci. Posterior angles of the sixth, seventh, ninth, eleventh, and thirteenth dorsal plates produced, the corners of the seventh being least extended of these.

Ventral plates transversely wrinkled, two to four — but mostly two — of the sulci being conspicuously deeper than the others.

Legs proportioned as in the previously described species, the tarsi being conspicuously slender with the first joint very long. Tibial process present on all fifteen pairs of legs. (Anal leg shown in Plate 4, fig. 9).

Coxal pores small and circular; 3, 3, 4, 4, 4. Ridges limiting the depressed porigerous area of moderate height, the two edges converging to a median keel on distal portion of coxa.

Gonopods of female with claw long, well curved, rather slender and acutely pointed. Basal spines as usual, the inner ones of each pair in ventral view presenting its edge and thus a much more slender outline than the outer one.

Length 10.5<sup>1</sup>-11 mm.

LOCALITIES.—Virginia (Natural Bridge!); Tennessee (Johnson City!).